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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/086,155	02/26/2002	Masaaki Katoh	259052002900	2654

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EXAMINER

HU, SHOUXIANG

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 07/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/086,155	KATOH, MASAOKI	
	Examiner	Art Unit	
	Shouxiang Hu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 April 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-11,13-15,17-21 and 23-27 is/are pending in the application.
- 4a) Of the above claim(s) 11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-10,13-15,17-21 and 23-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Claim 11 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 5.

Drawings

2. The corrected drawings were received on 4-28-04. These drawings are approved.

Claim Objections

3. Claims 1-3, 5-10, 13-15, 17-21 and 23-27 are objected to because of the following informalities:
4. In claim 1, the term of "its PN junction interface" should read as: --a PN junction interface between the N-type and P-type semiconductor layers--. In addition, claim recites the term of "in the light-emitting diode chip", but it is not clear between which layers in the diode chip the recited metal reflecting layer can be formed.
5. In claim 2, the term of "on the front surface or back surface" should read as: --above the front surface or on the back surface--.

Art Unit: 2811

6. Claims 5, 7, 9, 13, 17, 19, 23, 25, and 27 recites the subject matters that the metal thin film is formed on the back surface of the substrate via a dielectric thin film and that the (bottom) electrode is formed bellow the metal thin film; but they fail to clarify how the electrode can be electrically connected to the substrate.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 1-3, 5-10, 13-15, 17-21 and 23-27 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites the combination of the subject matters that the reflecting layer can be formed of a metal on a back surface of or in the diode chip and that one of the electrodes is formed above the semiconductor layer via the reflecting layer. However, such combination of subject matters are not fully supported by the original disclosure. According to the original specification and drawings, the reflecting layer (3, see Fig. 3) has to be formed on the front surface of the diode if the electrode (5b) is formed above the semiconductor layer via the reflecting layer (3). And, in the embodiment of Fig. 5, the electrode (23b) is

formed below the substrate via the reflecting layer, with the semiconductor layer formed above the substrate. Furthermore, it is not clear how one of the electrodes can be formed above the semiconductor layer via the reflecting layer if the recited reflecting layer is formed in the diode chip.

Regarding claim 3, it is not clear how the recited reflecting layer can comprise both the recited metal thin film and the recited DBR refraction grating structure.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1-3, 5-6, 8, 10, 13-18, 20, 21, 23, 24 and 26, insofar as being in compliance with 35 U.S.C. 112 and as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. ("Chu"; US 2002/0117672 A1) in view of Okazaki (US 5,670,797; of record).

Chu discloses a light-emitting diode (LED) comprising a LED chip (Figs. 1-6), including: a transparent substrate (101 or 107 or 201 or 501); a semiconductor layer (102-103, 202-204, 502-504) laminated on the substrate and formed of an N-type semiconductor layer and a P-type semiconductor layer, wherein at least a portion in the vicinity of the PN junction interface is rendered to be a light-emitting portion; a light reflecting layer (110 in Fig. 1B; or 205, Ni or Au, having a thickness range covering 100

Art Unit: 2811

nm; or 209, a DBR) for reflecting light emitted from the light-emitting portion; and a pair of electrodes (such 112 and 111 in Fig. 1B; or "P-pad" and 206 in Fig. 2, or 506-507), wherein at least the electrode 112 is formed on the semiconductor layer via the naturally reflecting layer 110. It is note the layer 110 in Fig. 1B is hatched in the same way as that for the thin metal layer 105 (Ni) in Fig. 1A. And, one of ordinary skill in the art would readily recognize that the layer 110 should also be made of similar metal like the one of layer 105, since they both serve as a contact electrode for the top semiconductor layer in the LED; and that it naturally functions as a reflecting layer in Fig. 1B.

Although Chu does not expressly disclose that the LED chip can be vertically mounted on a printed substrate with its PN junction interface being perpendicular to the surface of the printed substrate, Okazaki teaches that such a vertially mounted LED chip is desirable for high reliability and easy mass production (see the vertical LED chip 44 in Fig. 8 (b); also see the abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the vertical LED mounting structure of Okazaki into the LED of Chu, so that a LED with high reliability and easy for mass-production would be obtained.

Regarding claims 6, 8, 13-15, 17 and 18, it is noted that Ni is an art-known common material for forming a reflective layer; and that the thickness of the reflective layer is art-recognized parameters of importance subject to routine experimentation and optimization.

Art Unit: 2811

11. Claims 7, 9, 19, 25 and 27, insofar as being in compliance with 35 U.S.C. 112 as being best understood in view of the claim rejections above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu in view of Okazaki, as applied to claims 1-3, 5-6, 8, 10, 13-18, 20, 21, 23, 24 and 26 above, and further in view of Morita et al. ("Morita"; US 6,121,636).

The disclosure of Chu and Okazaki are disclosed as applied to claims 1-3, 5-6, 8, 10, 13-18, 20, 21, 23, 24 and 26 above.

Although Chu and Okazaki do not expressly disclose that a dielectric thin film can be formed between the substrate and the metal thin film, it is art known that a thin SiO₂ film can be desirably formed between the substrate and the metal thin film for smoothing the interface therebetween, as evidenced in Murita (see col. 5, lines 14-29):

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the smoothing dielectric thin film of Morita into the LED collectively taught by Chu and Okazaki, so that a LED with smooth reflective metal thin film would be obtained.

Regarding claims 9 and 27, Chu further teaches that the Au film can have a thickness range covering the recited thickness of the instant invention. And, it is noted that the recited thickness for the smoothing dielectric thin film is well within or overlap with the art-recognized normal thickness for a smoothing dielectric thin film; and that the exact thickness of a smoothing dielectric thin film is an art-recognized parameter of importance subject to routine experimentation and optimization.

Response to Arguments

12. Applicant's arguments filed on 4-28-04 have been fully considered but they are not persuasive.

Applicant's main arguments include: the applied prior art references teaches the claimed structure wherein one of the electrodes is formed via the light reflecting layer. In response, insofar as being in compliance with 35 U.S.C. 112, it is noted that at least the electrode 112 in Fig. 1B of Chu is formed on the semiconductor layer via the naturally reflecting layer 110 therein.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-

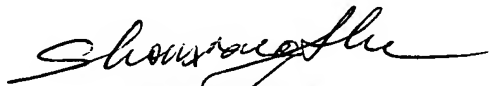
Art Unit: 2811

1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
July 13, 2004



SHOUXIANG HU
PRIMARY EXAMINER